THE PREVALENCE OF TRACHOMA IN PRIMARY SCHOOL CHILDREN IN MKURANGA DISTRICT COAST REGION, TANZANIA

A Cross Sectional Descriptive Study in Mkuranga Primary Schools

By

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A dissertation submitted in partial fulfillment of the requirements for the degree of Masters of Medicine (Ophthalmology) of the University of Dar es salaam.

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DEDICATION:

To my loved ones: Eugene, Lusinga and Daliso.

ABSTRACT

Objective: This was a cross-sectional school based study designed to determine the prevalence of trachoma in primary school pupils in Mkuranga district Coast region, Tanzania.

Methods: From the second to last week of July 2002, a total of eight primary schools were visited. One thousand, seven hundred and thirty nine (1739) pupils, aged between 5 and 20 years had their eyes examined for signs of trachoma. A World Health Organization grading chart of 1987 was used to assess for trachoma.

Facial cleanliness assessment was also made of the pupils examined. In this study, a clean face is defined as one with no eye discharge, nasal discharge or left over food around the mouth. A dirty face was diagnosed if a child had at least one or more of the above clinical appearances.

Environmental sanitation was assessed as being fair or poor based on the availability of a water source within the school compound, presence of a latrine and on the presence of a refuse pit.

Results: The examined population varied in age from 5 to 20 years, with a mean age of 11.74 years. Males comprised 49.7% whereas females comprised 50.3%.

Active trachoma (T.F. and T.I) was diagnosed in 9% of the examined pupils. There were about four times more pupils with T.I (6.2%) than with T.F (2.8%).

The prevalence of trachoma significantly decreased with increase in age from 14.8%(5-9years) to 4.7%(15-20years) p=0.00185972.

Of the pupils examined 68(3.9%) had dirty faces 55 (12.3%) and 2(0.6%) from the youngest and oldest age groups respectively .Out of those who had a dirty face 15(22.0%) had trachoma.

Environmental Sanitation was poor in terms of proximity to water, unavailability of refuse pits and inadequate latrines.

Conclusion: The findings suggest that trachoma is present in primary school pupils in Mkuranga district. Active trachoma is associated with dirty faces. The visited schools sanitation is poor.

TABLE OF CONTENTS **PAGE**

Title

Certification..... I

Declaration and Copyright ii

Acknowledgement iii

Dedication V

Abstract..... Vi

Table of contents Viii

Abbreviations x

Introduction and literature review 1

Historical Aspect..... 4

Aetiology 7

Epidemiology 12

Clinical presentation..... 14

Classification..... 16

Treatment..... 19

Prevention 24

Rational..... 27

Objectives 29

Methodology 30

Results..... 39

Discussion..... 46

Conclusion 51

Recommendation 52

References 54

Appendix 68

Abbreviations And Definitions

W.H.O- World Health Organization

G.E.T-Global Elimination Of Blinding Trachoma

S.A.F.E –Surgery Antibiotics Facial cleanliness and Environmental change

C. Trachomatis- Chlamydia Trachomatis.

T.F- Trachomatous follicles

T.I- Trachomatous inflammation (intense)

T.S-Trachomatous scarring

T.T- Trachomatous trichiasis

T.O - Trachomatous opasification

MEMKWA- [Swahili word] system approved that allows pupils older than seven years to enroll to class one.

INTRODUCTION

Human ocular trachoma is a disease that causes a chronic keratoconjunctivitis.[1]The causative agent is *chlamydia trachomatis* serotypes A.B and C. The disease progresses from conjunctiva inflammation to conjunctiva scarring, lid deformities, corneal abrasion and ulceration, and finally corneal opacification. [2,3]

Measuring the global burden of trachoma has not been easy taking into consideration the distribution of the disease and its social profile[4]. Its mainly found in poor rural communities where basic health facilities are non existent or are very poor.[5] Active trachoma occurs predominantly in children in hyper endemic communities with the risk of blinding complications occurring in the middle age and in older adults.[6] Poor personal and environmental hygiene coupled with lack of knowledge and skills adds much to this needless blindness. [7]

Early efforts on blindness prevention by the World Health Organization [WHO] began in the 1950s during which time much devotion was put on prevention and possible control of trachoma. [8] The efforts involved in providing assistance to member states to assess the magnitude of trachoma and institute control activities. These activities were delivered in national trachoma programmes. These activities, although they

succeeded in reducing endemicity and preventing blindness from trachoma, they were generally not sustainable. [9]

From hospital statistics, the most affected regions in Tanzania are Dodoma, Singida, Shinyanga, Arusha, Tabora, Iringa and Mtwara. No exact data is available for each region except Dodoma where it was estimated at 68.9%. This data is hospital based and not representative for the district. School surveys done in Singida rural schools showed the prevalence of trachoma to be 31%. In Masasi urban schools it was rated at 45% and 16.1% in Bagamoyo schools. In Dodoma region, the prevalence of trachoma in primary schools was found to be 7.1percent [10] In Mkuranga district, no data exists as no school survey had been done before.

The population growth and shrinking resources have constrained many government health care funding. The WHO, in cooperation with various non-governmental organizations and national health programmes recently began implementing a programme to globally eliminate blinding trachoma by the year 2020. The programme has adopted **s**urgery to correct entropion/ trichiasis, **a**ntibiotics to treat infectious trachoma, **f**acial cleanliness to reduce transmission and **e**nvironmental

improvement such as control of disease spreading flies and access to clean water (SAFE) [11,12].

Tanzania is one of the countries that adopted the WHO goal of eliminating blinding trachoma by the year 2020. Working under the coordination of the Ministry of Health (MOH) and International Trachoma Initiative (I.T.I) along with other national and international partners, trachoma –control activities have been started in a number of districts. Mkuranga is one of the districts where trachoma activities have recently began.[13]With the support of International Trachoma Initiative the first survey in Mkuranga district was done in the year 2001. Results of this survey showed the prevalence of trachoma in the community to be 22.19percent.[14]

Transmission of trachoma appears to occur mostly within the family unit and school children form the largest reservoir of infection. [15,16] Risk factors for trachoma transmission have been found to be poor personal and environmental hygiene. A general improvement in hygiene reduced dramatically the prevalence and severity of trachoma in children.[17]

HISTORICAL ASPECT

Trachoma has been known since antiquity. In Egypt, descriptions of trachoma, its medical and surgical therapy were found in the Ebers papyrus in the nineteenth century B.C. The name trachoma comes from a Greek word for rough swelling, a descriptive appearance of the conjunctiva in chronic trachomatous infection. It was known, in Greece by the first century B.C. The treatment for trichiasis was described in China in the twenty-seventh century B.C. In the middle- ages, trachoma was disseminated by the crusaders returning from Palestine. It appeared on the European scene following the Napoleonic wars of 1798-1799. The disease was widespread in the English and French troops and was found to be a major cause of blindness in the English military population.[18] The Egyptian ophthalmia as it was called, was widespread in Europe during the nineteenth century. It is reported to have been imported into America by European settlers and immigrants from the Far East. In the 19th century, it was one of the diseases that immigrants to the United States were screened for and if found to have trachoma were sent back to Europe.[19]

In 1907, Halbert Staedter and Von Prowazek indentified the Chlamydia inclusions in conjunctiva scrapings from orangutans that had been infected with human trachomatous scrapings. The first accepted

isolation of *Chlamydia trachomatis,* was reported in 1957 by T'ang and his associates in Peking.[20]

The first widely used therapy for trachoma was application of copper sulphate solutions or abrasion of the conjunctiva with copper sulphate crystals. This was followed by introduction of sulphonamides, which were administered by mouth or by the topical application of powder to the conjunctiva cul-de-sac.[21] In the early 1950's the tetracycline and erythromycin were shown to be effective when applied for 60 days continuously topically. It was found to be effective when used or given by the intermittent method which consisted of a five day application of tetracycline each month and continuing the regimen for six months. Topical treatment is not practical for mass treatment as it is difficult and uncomfortable to apply, blurs the vision and it must be used over an extended period of time. Systemic antibiotics have shown some efficacy against active trachoma but carry a high risk of adverse side effects; hypersensitivity reactions with sulphonamides, adverse effects in children and foetuses with tetracycline and abdominal disturbance with erythromycin.[21]

A break through in systemic treatment of trachoma has of late come up with the introduction of oral azithromycin. [22] A single dose of

azithromycin 20mg/kg has proved to be as effective as six weeks of twice per day topical tetracycline.[23] Re-infection is common when only individual cases are treated. Mass treatment with oral azithromycin is more practical and it is hoped that success in the global elimination of blinding trachoma by the year 2020 will be feasible. Medical treatment alone does not give a lasting control as such facial cleanliness and environmental improvements have to go alongside with surgery to correct eyelid deformities for those already with trichiasis.[24]

Since the 1950's the WHO has spearheaded, efforts to help member states to meet the challenges of needles blindness.[25] The global initiative for the elimination of avoidable blindness referred to as VISION 2020-the right to sight was launched in 1999. It aims to combine efforts between WHO and a number of international nongovernmental organizations and other interested partners in the elimination of preventable blindness. International efforts to control the disease are based on the SAFE strategy launched in 1998which combines **s**urgery, **a**ntibiotics, **f**acial cleanliness and **e**nvironmental improvement. [26]

AETIOLOGY

Chlamydia. trachomatis is an obligate bacterium which has features resembling bacteria as well as virus. Like bacteria, it has a cell wall, has both DNA and RNA in its cellular structure, multiplies by binary fission, and responds to antibiotics. Like a virus the chlamydial agent lives and multiplies inside a host cell and depends on host organism for ATP. The *C. trachomatis* is cultured in embryonated egg yolk sac or in tissue culture on irradiated Mc Coy cells.[20-21.27]

C. trachomatis is acquired by direct contact between healthy persons/ children and the contaminated fingers of an infected person/ child or through exchange of contaminated towels , handkerchiefs or other materials used for cleaning eye secretions.[28] Flies act as mechanical vectors for the transmission of trachoma . They pick the *C. trachomatis* from eyes of an infected individual and transfer them to uninfected host when they feed on eye discharges.[28]

In The Gambia a study was done to determine whether flies were important vectors in the transmission of trachoma. In this study, in one village flies were removed from the environment by spraying with

insecticides while the other village acted as a control. At baseline, the prevalence of active trachoma was similar in the two villages but after three months of fly control, the prevalence of active trachoma was lower in the intervention villages as compared to the controls. The study was done both in the wet and dry season.[29]

In another study, in The Gambia, Emerson found that not all flies transmit trachoma. The filthy or bazaar fly, *Musca Sorbens* was found to be the culprit for transmission of trachoma followed by the common housefly *Musca domesticus* .[30]

Musca sorbens breeds in solid faeces and not in latrines. In Egypt less trachoma was found in households in which simple pit latrines were present. In this study, the presence of pit latrines in all houses even when full and unscreened was found to have reduced trachoma prevalence form 49-35 percent.[31] In the Australian Aboriginal communities however, the bush fly *Musca Vetustissima* was found to be associated with increased levels of trachoma. In this study, the bush fly's population was found to be very high during the wet season (6-146 flies per hectare per month). During this same season (wet), there was a significantly higher rate of trachoma (46-69%). A lower rate of trachoma was found in the dry season (14-59%) at which time, fly population was found to be very low. [32]

In Tanzania, face fly scores were counted on children's faces. The presence of flies on children's faces was found to be consistently associated with increased risk of trachoma. The prevalence of active trachoma was found to be higher in the rainy season than in the dry season, 69 and 39 percent respectively. [33]

Lack of water has long been associated with trachoma. In hyperendemic areas that are dusty and dry with insufficient water, have been found to have higher rates of trachoma. This has been associated with not having enough water for hygienic purposes.[34] In Kenya Larry Schwab et al found similar results.[35] However, Ezz al Arab in his survey in rural Nile Delta of Egypt, found conflicting results. Despite the area having enough water, trachoma remains to be of public health significance (36.5%) with intense trachomatous inflammation exceeding follicular trachomatous inflammation by 1.89 times. [36]

Repeated episodes of infection with *Chlamydia trachomatis* are important in maintaining the sustained inflammatory disease. This re-infection occurs within the family unit especially between mothers/ caretakers and their children.[37] Close contact between mothers /caretakers and their children increase the frequency of re-infection in mothers /caretakers and thus increase the chance of blinding complications in women as compared to men.[38]

Barsoum I.S et al in their study, done in school children in rural Egypt, found that the prevalence of infection was higher in the younger age groups and decreased throughout primary school. [39]

In The Gambia, the duration of human ocular *Chlamydia trachomatis* was found to be age related. The younger the patients, the longer the disease prevailed, and as the age increased, the duration of trachoma disease shortened. It was assumed in this study that, this could be due to adaptive cellular immune mechanism.[40]

In Tanzania Taylor in a longitudinal study, found children who did not develop clinically detectable trachoma despite demonstrating Chlamydia in their conjunctiva. In this study, it was assumed that these children could be relatively resistant to Chlamydia infection, and were able to clear the infection without developing clinical disease. [41]

The incubation period is 5-21 days. The infectious form or elementary body (EB) attaches to the surface of host (conjunctival epithelial cell) and enters it through phagocytosis, pinocytosis or receptor mediated endocytosis. Within 6-8 hrs, re-organization occurs and the elementary body becomes a reticulate body (RB). This replicates intracellulary through binary fission and produces a variable number of cytoplasm inclusions. This life cycle is complete when infectious particles are

released by cell lyses, extrusion of intact inclusions or exocytosis. This process initiates an inflammatory reaction of the conjunctiva, mainly in its upper palpebral conjunctiva, the upper fornix and less commonly in the lower fornix, plica and bulbar conjunctiva. The infection is at first mild, but with repeated infections, becomes intense. Follicles and papillae appear on the upper palpebral conjunctiva. In children less than two months, follicles may not be seen due to lack of lymphoid tissue at this age. The papillary hyperplasia makes the upper palpebral conjunctiva look velvet. The trachomatous infection when treated heals without any trace of previous infection but with repeated infections the upper tarsal plate becomes scarred. This scarring of the tarsal plate appears like a white line running across the tarsus (Altes line). Retraction of the scar tissue causes the eyelid margins together with its eyelashes to turn inwards (entropion). These eyelashes constantly rub the corneal surface (trichiasis) causing a lot of pain tearing, and photophobia.

Constant rubbing of the corneal surface by the in-turned eyelashes leads to corneal abrasion, which with time will lead to corneal ulceration. The corneal ulcers heal by cicatrisation which depending on the degree of erosion can be either a nebulae, macula or Leucoma. Corneal scarring will prevent light from reaching the retina, causing corneal blindness. Other affections of the corneal due to trachoma include tear

deficiency due to scarring of conjunctiva goblet cells, reduced resistance to infection due to changes in integrity of the eye surface, refractive errors due to corneal scarring.The upper part of the cornea may get infiltrated with superficial blood vessels (Pannus). By their appearance, pannus can be either,

- Pannus tenius –Recent and thin
- Pannus vasculosus-Highly vascular
- Pannus crassus-Thick and fleshy
- Pannus ciccus-Cicatricial.[20,42]

EPIDEMIOLOGY

Trachoma remains the world's leading infectious cause of blindness and the leading cause of ocular morbidity.[43] Trachoma used to be a common cause of blindness worldwide but is now predominantly a disease of developing countries. Many of the world's developed countries are now free from trachoma because of, improved standards of personal and environmental hygiene, associated with large- scale economic and social changes.[44] Since the discovery of the causative agent *(C. trachomatis)* in the early 1900's, knowledge of the etiology and preventive measures of trachoma has grown rapidly. Despite this, the disease remains endemic in the poor and less privileged areas of the developing world. [45]

Trachoma is distributed worldwide. The disease is endemic in North and Sub Saharan Africa, the Middle East, North India, Parts of Asia, in the Aborigines of Australia, the Pacific Islands and Latin America. The disease has been associated with lack of water, poverty and poor personal and environmental hygiene. [46]

The World Health Organization (WHO) estimates that 150 million people Worldwide suffer from active trachoma, while an additional 6 million are blind or are at risk of visually disabling complications.[47] In Tanzania, trachoma is a major health priority. Ten out of twenty regions are trachoma endemic More than 12 million people are at risk of infection, 2 million children have active disease and 45,000 people have been blinded by trachoma. [48]

The infectious pool includes children especially preschool children, mothers and women involved in childcare. Contributing factors to the persistence of trachoma in the community include social behaviors; keeping animals like cows too close to living areas, lack of enough water and unavailability of latrines. All these increase the fly density (vectors) in the community. [49]

CLINICAL PRESENTATION

Clinical presentation of ocular trachoma varies from a mild condition to a severe and blinding disease. The disease progresses slowly and it takes about 2-3 weeks before specific ocular changes become apparent. Symptoms are typical of a chronic keratoconjunctivitis with an irritable red eye and a discharge, which is usually slightly mucopurulent, when there is no bacterial secondary infection. When there is bacterial super infection, the eye discharge can be quite profuse and purulent. The disease is nearly always bilateral although one eye may be more affected than the other. There may be eyelid edema, pain and photophobia when the cornea gets involved.

In the conjunctiva trachoma presents itself in the form of either, follicles and papillae. Follicles and papillae can present together in the same eye. These are more numerous in the upper conjunctiva. Some may be around the margins of the cornea (Limbus). As the disease progresses, the follicles around the limbus become scarred and shrink forming little pits known as Herbert's pits. Herbert's pits, when present around the limbus of an individuals' eye, is a sure sign that, the subject once suffered from trachoma.

Papillae are found on the surface of the conjunctiva especially on the inside of the upper eyelid. They obscure the underlying blood vessels

and make the conjunctiva look velvet to the naked eye. The period of active inflammation may persist for weeks but eventually healing begins with formation of a scar (fibrosis). The fibrous tissue appears as white opaque lines, (line of Von Arlt) or patches under the tarsal conjunctiva, which obscure underlying blood vessels. Scarred tissue and active inflammation may be seen in one eye with repeated infections. In mild cases, faint scars are left on the upper tarsal plate when the disease burns out. With repeated infections, the fibrous tissue in the conjunctiva slowly contracts deforming the eyelid margin, which turn inwards against the eyeball (entropion) and make the eyelashes rub (trichiasis) or scratch the cornea. Fibrous tissue around hair follicles may shrink causing displacement of an eyelash and making it emerge irregularly from the eyelid margin. The eyelash that emerges irregularly from the eyelid margin may also cause trichiasis, but without entropion. The meibomian glands may be obstructed or even destroyed. The fornices and bulbar conjunctiva are at risk of damage from fibrosis. The goblet cells that secrete mucus and located in the fornices get destroyed. The quantity of mucin produced, is reduced and this may lead to dry eye syndrome. The conjunctival epithelium loses its moist, wettable surface due to keratinizaiton. The lacrimal passages can get obstructed due to scarring causing overflow of tears onto the cheeks (epiphora). Damage to the lacrimal gland can reduce tear production.

The *Chlamydia trachomatis* organisms also invade the corneal epithelium especially its upper part. A punctate or diffuse superficial keratitis is the early sign of corneal involvements that is usually seen only with a slit lamp. These will stain with fluorescein dye giving them a faint green haze. As the infection becomes more severe, the inflammation in the superficial cornea becomes more obvious. Superficial blood vessels grow from the limbus onto the cornea (pannus). In severe cases the corneal epithelium may break down to form a shallow ulcer. Damage to the eyelids, conjunctiva and lacrimal apparatus weaken the defense mechanisms of the eye. The risk of secondary corneal infections, and corneal scarring therefore increases. Without prompt treatment, the cornea continues to get scarred and vascularized, making it loose its transparency. The opaque scarred cornea obscures light from entering the eye and in so doing causes corneal blindness. [1-3,6,20-21,50]

CLASSIFICATION OF TRACHOMA

Mac Callan in 1908 first classified trachoma into four clinically recognizable stages but this has been changed for a more simplified classification. In 1987 the World Health Organization (WHO) designed a fairly simple classification that can be used by anyone doing community

surveys on trachoma. To help plan the best management for the patient, anyone found with at least two positive signs is considered as having trachoma.[51]

Trachomatous Inflammation- follicular (TF)

This is diagnosed on the presence of five or more follicles measuring at least 0.5mm in diameter on the central upper tarsal conjunctiva.

Trachomatous Inflammation- intense (TI)

There is pronounced inflammatory thickening of the tarsal conjunctiva that obscures more than half of the normal deep tarsal vessels. The tarsal conjunctiva appears red, rough and thickened. There are usually numerous follicles that may be partially or totally covered by the thickened conjunctiva.

Trachomatous Scarring (TS)

These are seen as white lines, bands or sheets in the tarsal conjunctiva. They are glistening and fibrous in appearance. Scarring may obscure the tarsal blood vessels.

Trachomatous trichiasis (T.T)

When at least one eyelash rubs on the eyeball. Evidence of recent removal of in-turned eyelashes is also graded as trichiasis.

Trachomatous Corneal Opacity (CO)

These are easily visible corneal opacities over the pupil. The pupil margin is blurred when viewed through the opacity. Such corneal opacities cause significant visual impairment (less than 6/18 or 0.3 vision).

Pupils that were found with signs of active trachoma (TF, TI) were given one tube of tetracycline eye ointment with instructions on how to use it. Where a child was too small to take instructions, a brother/ sister within the school or teacher were given the medicines with instructions to convey to the caretaker of the child. They were also advised to take more of the same drug at the nearest health facility.

Laboratory Diagnosis.

Most laboratory tests used to indentify *C. trachomatis* are very expensive need a specialized laboratory and trained personnel. Further, in-spite of *C trachomatis* being known as the cause of trachoma, the chlamydial agent is not always demonstratable even in the presence of typical clinical trachoma. The reason for this is unknown. In one study, Hugh in his laboratory investigations, observed patients who had clinical

evidence of trachoma, but were negative on laboratory investigation, and others, who had no sign of clinical trachoma yet tested positive on laboratory investigation.[53] The following are laboratory investigations used to identify trachomatous infection.

i) Conjunctival Cytology – Giemsa Stained Smears show a predominantly polymorphonuclear reaction with presence of plasma cells.

ii) Detection of inclusion bodies in conjunctival smear may be possible by Giemsa stain, Iodine or Immunofluorescent staining.

iii) Isolation of the chlamydial agent. In olden days, embryonated yolk sacs were used to inoculate the chlamydial agent but currently the chlamydia can be grown on Mc. Coy cells.

iv) Serotyping – This is done to detect specific antibodies using microimmunofluorescence.

TREATMENT.

Treatment of trachoma can be divided into medical treatment and surgical treatment. In most cases where patients have complications of entropion and trichiasis a combined regime of medical and surgical treatment is used. The treatment of trachoma in endemic areas is extremely difficult. Children treated by topical therapy are rapidly re-

infected due to contact with other untreated infected children. This usually gives an impression that a certain number of patients do not respond to medical treatment.

Since the early 1950's, the mainstay of trachoma treatment has been the prolonged use of topical tetracycline. The Chlamydial agent is sensitive to a number of antibiotics including sulphonamides, erythromycin and tetracycline. In general the infrequent but predictable occurrence of side effects has prevented the widespread use of systemic antibiotics on a mass scale. Systemic tetracycline can discolour and damage the teeth of children erythromycin causes gastrointestinal disturbances and Sulphonamides cause severe hypersensitivity reactions.[2,3,20,21]

Recently azithromycin has been shown to be effective in treating trachoma when given as a single dose, 1 gram in adults. The drug is absorbed in 2-3 hours, gets concentrated in the tissues including conjunctiva, where tissue levels are maintained for up to eight days. Azithromycin is relatively free of serious adverse effects and it can be used in children aged six years and above. The dose is 20mg/kg single dose. Adverse effects in pregnant women hare not been established as yet. Compliance is good. Azithromycin has an added advantage of decreasing other common infections when used. Other than this,

azithromycin is expensive and thus the access to this treatment by the targeted population is a matter of concern. Tetracycline remains the cheapest and readily available medicine.[54-57]

SURGICAL TREATMENT

The surgical treatment of trachoma is essential in patients with trichiasis and entropion.

These patients should be managed by early surgical correction. Some may require several entropion correction procedures because of the progressive shortening and shrinking of the tarsus and recurrent entropion and trichiasis.

SURGERY TO REMOVE INTURNED EYELASHES

Epilation- This is used to remove few in growing eyelashes. These are pulled out with epilation forceps. These will however soon grow again.

Electrolysis- It destroys the roots of the eyelashes using an electrolysis needle.

Cryotherapy- This destroys the roots of eyelashes using a cryoprobe at a temperature of about (-25^{0}c).

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In Japan trials have been made with argon laser to destroy eyelashes with their roots. Results are reported as promising. [58]

Oguz and Aras in their clinical trial showed that thermo ablation is effective in treating trichiasis.[59]

Excision- This is done when only a small area of eyelashes is misplaced. It is possible to excise these eyelashes together with their roots.

OPERATIONS THAT REALIGN THE EYELASHES

Billamellar Tarsal Rotation Procedure (BTRP)

The World Health Organization recommends this simple procedure that gives good results and is simple to perform. The upper eyelid is divided transversally through all layers, and then re-sutured in an everted position. [57]

Anterior Lamella Shortening

This operation removes some skin and orbicularis muscles so as to shorten the anterior lamellar and in so doing help the eyelashes to evert.

Wedge Resection

A wedge is excised from the front of the tarsal plate so that the margin of the tarsal plate can rotate outwards on lid closure.

Anterior Lamella Repositioning

Through the gray line the eyelid is divided into anterior and posterior parts. The posterior lamella is then brought further forward than the anterior lamella and sutured in a new position. The eyelid margin with its lashes gets pushed up relieving trichiasis.

Mucous Membrane Grafting

The conjunctiva and tarsus is lengthened with a graft. The graft can be of mucous membrane from the mouth or cartilage from the nose.

Division and Rotation of the lower end of the Tarsal Plate, from the Conjunctival side (The Trabut Operation)

This corrects entropion of any severity but the operation is difficult to perform and thus not suitable for use in the field.

CORNEAL OPERATIONS

The severe corneal scarring secondary to trachoma may be treated by keratoplasty. However, the success rate of corneal grafts is usually poor. Factors for poor success rage from corneal vascularization, the dry eye state of most patients, recurrent eyelid deformities to poor patient hygiene and understanding of follow up care. The inability of people of low social and economic state in the developing rural areas to understand adequately the grafting procedure and subsequent care is a crucial factor. The subsequent changes in visual acuity, associated with early graft rejection, are ignored and the patients return weeks after the onset of symptoms with totally failed and unsalvageable grafts.[61]

PREVENTION

Prevention of trachoma primarily addresses the F and E component of the SAFE strategy. Facial cleanliness to reduce transmission and environmental improvement such as control of disease spreading flies, and access to clean water [62].

People with clean faces are less likely to have trachoma. Personal hygiene is poorer in younger than in older children. It is assumed that promoting hygiene in general may reduce trachoma. [63]

In a controlled study done in Kongwa, Tanzania in an effort to evaluate the impact of a clean face on trachoma, Sheila West found that a vigorous campaign to promote facial cleanliness reduced the likelihood of developing intense trachoma[64]. Despite this there was a tendency of trachoma to increase again when the programme was over. Other studies however have attributed the reduction of active trachoma to chance variations, seasonal effects and secular trends [65]. Unfortunately for most surveys of this kind, promising results are usually found but sustainability is always a problem resulting in a resurgence of blinding trachoma. Communities that are able to sustain these intervention programmes are more likely to see a disappearance of blinding trachoma. In the Elim Care Groups set up in 1976 in the northern part of South Africa, with improved health and quality of life, trachoma ceased to be a public health problem.[66]

Flies are vectors for transmission of many eye and diarrhea diseases.

In spite of this it has been found that not all flies are vectors for transmission of trachoma. In The Gambia, control of the fly *musca*

sorbens was found to reduce the prevalence of trachoma in the community [67].

Musca sorbens breeds in solid faeces lying on the ground and not in latrines. Provision of pit latrines is therefore expected to reduce the breeding medium for *M. Sorben's* larva and so reduce the vector for transmission of trachoma. In studies done in central Tanzania Brazil, Egypt, Malawi, and Ethiopia, the absence of a household latrine had been associated with a higher prevalence of active trachoma. [68-71]

The environmental component is unfortunately not recognized or accepted with ease as an important factor in disease transmission by the poor underdeveloped and less educated people in the endemic areas. To raise awareness in large populations and at a relatively low cost, radio broadcasts and television in some settings are used. The Ministry of Health, local broadcasters and community educators transform trachoma prevention messages into dynamic and entertaining media that engage the mass through drama, music and comedy.

RATIONALE OF THE STUDY

Trachoma has been prevalent in Tanzania and recorded since the 1960's. A community- based study done in 2001 in Mkuranga District had shown that the prevalence of trachoma in the general population was 22.19 percent.[14] This study did not reflect the prevalence of trachoma specifically in primary school going children though they are known as potential reservoirs for the transmission of trachoma.[16-17]

The government of Tanzania by making primary education free now ensures that all eligible children to start school are in school. This is causing overcrowding that may lead to easy transmission of communicable diseases like trachoma from one child to another. In Mkuranga district, a study to evaluate the impact of this overcrowding in schools and transmission of communicable diseases has not been done, though there has been an increase in the number of pupils enrolled in the last few years (district school data).

If the global strategy, to eliminate blinding trachoma by the year 2020 is to be feasible, urgent, relevant and correct measures ought to be taken. The aim of this study is therefore, to establish the present prevalence of trachoma in primary school children in Mkuranga district. The study findings will provide baseline data on the prevalence of trachoma in

primary school children in Mkuranga district. It is also hoped that recommendations will be given with regards to establishing affordable and sustainable preventive and control measures (Introducing SAFE strategy.)

BROAD OBJECTIVE.

1. To determine the prevalence of trachoma in primary school children in Mkuranga district, Coast region Tanzania.

Specific Objectives.

1. To determine the prevalence of trachoma in the study population.

2. To determine the prevalence of active trachoma in the study population by age and sex.

3. To determine the association of a dirty face in the study population with trachoma.

4. To determine the prevalence of ocular complications of trachoma. (entropion, trichiasis and corneal opacification).

5. To make observation on the state of environmental hygiene of the school, as regards Availability of water within the school compound, latrines and refuse pits.

METHODOLOGY

Study design

The study was school based descriptive and aimed at assessing the clinical signs of trachoma in primary school children in Mkuranga district coast region Tanzania. It is also aimed at assessing facial cleanness of the pupils and the school's environmental sanitation.

Description of study area

The study was undertaken in Mukuranga district coast region of Tanzania. It has an area of approximately 2,432 sq km, with an altitude of about 200 feet above sea level. It has a total population of about 132,639 where 80% live in rural areas (census 1988). There are two main seasons, a dry season from July to October and a wet season from March to May. It has a rainfall of about 800-1000 mm per year. Temperatures are moderate ranging from 26°C to 28°C. There are many unprotected shallow wells and swamps that serve the area with water for domestic use.

The district is made up of 101 villages that are subdivided into hamlets. It is served by eighteen health facilities most of which are dispensaries. The inhabitants of the district are mainly subsistence farmers and fishermen. They grow cashew-nuts cassava, coconuts and fruits.

Traditional fishing on the Indian Ocean, provide the district with a good source of protein. The staple food is cassava. Residents of Mkuranga are mainly the Wazaramo. However there are other tribes from different parts of the country.

The main road is the Kibiti-Lindi road which transverses the district as it proceeds to the southern provinces of Tanzania. Water transport on the Indian Ocean is mainly by means of canoes. There is no rail or air transport. The district is supplied with electricity in a few urban stations. The district has eighty- one primary schools that are located in the fifteen wards.

Sampling and Sample size Determination

Multistage sampling technique was applied to obtain the study sample. Mkuranga district has fifteen wards and out of these eight wards were randomly selected. The names of the schools in each of the eight selected wards were listed down and then the name of each school was written on a small separate paper folded and put in a small box. These were then mixed. Thereafter a colleague was asked to pick one among the mixed pieces of paper and any one that was randomly picked was included in the study. The same procedure was repeated until eight schools were chosen, one from each of the selected eight wards. Pupils

from class one through to class seven of the selected, schools were included in the study. Pupils from nursery class (where one existed within the school.) were also included.

The sample size was calculated using the formulae

$$N = \frac{Z^2 \times P \times Q}{n}$$

Where N = Number of pupils required

P = Estimate of proportion of pupils with trachoma taken as approximately 15%

D= Maximum likely error taken to be 5%

Q= Proportion of pupils without trachoma (100 –15).

Z= Percentage point of the normal distribution corresponding to significant level of 5% or the standard normal deviation set at 1.96.

Therefore $N = \frac{(1.96)^2 \times 0.15 \times 0.85}{(0.05)^2} = 196$ Pupils.

Then 10% of 196 is approximately 20, which was added to 196 = 216 making this to a round figure of 250. Therefore 250 pupils per school were included in the study.

Sampling Interval.

Sampling interval for every class was calculated using the formulae

$$K=\frac{N}{n}$$

Where K= Sampling interval

N= Total population of pupils in a class

n= The needed number of pupils to be sampled .

Where a school had less than two hundred and fifty pupils, then all the pupils that were present on the day of the study were included in the study. .

Research Assistants.

Research assistants consisted of a health officer from Mkuranga's district health centre and one health teacher from each of the eight selected schools. The health officer acted as a guide who took a leading role in showing us the directions to the different schools and at the same time, he was responsible for taking visual acuity. The teacher filled in personal particulars of a participant / pupil on the appropriate space on the questionnaire.

Research assistant's training.

Training of research assistants was done at Mkuranga health center. At this meeting emphasis was put on how to fill the forms and on taking the actual age of the child as given by the child himself and not by the age given in the register. The health officer was trained on how to take visual acuity.

The questionnaires were reformulated for clarity to meet the aim of the study. The final version of the questionnaire as well as some modification on the methodology were done ready for use in the field.

Pre- testing

Pre- testing was done on the same day as the training of research assistants. Pre- testing was done on fifty pupils from the nearest school to the health centre. This school was not included in the study. Corrections were made where a question was not properly understood.

Community Sensitization.

Sensitization of the community was done through village leaders of the eight selected schools. These were invited to a meeting held at the districts health center the following day after meeting with the research assistants. They were first briefed about trachoma, how it gets

transmitted, how it causes the disease, and the long -term complications of the disease. The association between frequent re-infections in childhood and blindness in adulthood was mostly emphasized. Questions were allowed and answers were given to the best of the investigator's knowledge. It was also made clear to them that not all pupils in the selected schools would be included in the study and the reason for this was explained. However those that happened to have eye problems and were not included in the study were attended to and managed in the same way as those taken in the study.

ETHICAL CONSIDERATION

The research clearance was obtained from the Muhimbili University College of Health Sciences (MUCHS). Before proceeding with data collection, permission from Mkuranga education officer through the districts officer was sought and granted. Research assistants were introduced to the village leaders and parents of the pupils at a meeting held at the districts health center. The day and date of conducting the study at each school was made known to them beforehand.

Pupils who happened to have eye problems, irrespective of being in the study or not, were treated accordingly

Data collection

Data was collected for two weeks starting from the second to end of July 2002. With help of research assistants the principle investigator collected the data.

Examination of the Participants / Pupils

The participants / pupils were recruited by the health teacher who had their personal particulars filled in the appropriate place on the questionnaire form. Each pupil was then given his form and then directed to wait on a bench.

Taking Visual Acuity.

From the bench where the pupils sat with their questionnaire forms, the health officer took one child at a time, took his form and asked him his name, father's name and age to make sure the pupils did not exchange the forms. The pupil was then instructed to sit comfortably on a chair six meters away from the chart. He / She was then asked to occlude the left eye using the palm of his/ her left hand, and asked to read the letters on the standard Snellen's chart. For those who did not know the alphabetical letters, an illiterate E chart was used. The line with the smallest letters on which the majority of letters was read accurately was recorded. The same procedure was repeated for the left eye. This

information was recorded on the appropriate space on the questionnaire form. The pupil was then directed to a second bench where they sat with their forms waiting for eye examination.

Eye examination

This was done by the principal investigator who first rechecked the personal particulars of the child to make sure it was his /hers. The state of the child's face was rated as dirty if he/she had eye discharge nasal discharge or leftover food around his mouth. This information was filled on the appropriate place of the questionnaire form.

Using a torch and a magnifying loupe x 2.5, the eyelid margin was inspected for entropion, and trichiasis. The participant / pupil was then asked to look down. The right upper eyelid was then everted and using a torch and magnifying loupe, changes on the inside of the upper eyelid were noted and filled on the questionnaire form. The same procedure was repeated for the left eye. Over the area of the tarsal conjunctiva there are normally large deep lying blood vessels that run vertically. Changes on the everted conjunctiva were graded according to the recent WHO grading system of 1997 [44,47,52]. The cornea was inspected while the pupil is asked to look straight ahead first the right eye then the left eye.

Part B of the questionnaire was filed by the principal investigator by assessing the following;

- Availability of a source of water within the school compound. (The teachers were asked on the school's source of water).
- Presence or absence of a latrine and where available assessment of its hygienic state, was done by the investigator who physically visited the latrines.
- Presence of a refuse pit within the school compound.(information was collected by asking teachers).

Comments on the state of the school. environmental sanitation were made.

At the end of the survey at each school, forms were checked again and arranged serially.

Data processing and analysis

After the whole fieldwork was done, the principal investigator returned back to Dar- es -Salaam where the data was entered into the computer using Epi Info 6 for analysis.

Data Presentation.

Tables have been used to summarize the results obtained.

RESULTS

The sampled population of pupils from the eight primary schools in Mkuranga district coast region of Tanzania was 1739,making the coverage to be 86.9%.

Table 1. **Distribution of pupils according to schools**

School's Name.	School population	Nº examined pupils	School Coverage n=250.
Nyanduturu	296	222	88.8%
Vianzi	500	232	92.8%
Nyamato	468	250	100%
Magawa	492	250	100%
Mbezi	162	121	48.4%
Ngarambe	306	248	99.2%
Magoza	409	250	100%
Tambani	281	166	66.4%
Total	2914	1739	86.9%

Coverage per school varied greatly with the highest (100%) coverage in three schools,Nyamato, Magawa and Magoza .The lowest (48.4%) was found at Mbezi and Tambani primary school (66.4%) respectively.

Table 2. **Distribution of the pupils by Age / Sex**

Age in years	Male		Female		Total	
	No	%	No	%	n=	%
5-9	185	41.4	262	58.6	447	25.7
10-14	500	52.5	453	47.5	953	54.8
15- 20	180	53.1	159	46.9	339	19.5
Total	865	49.7	874	50.2	1739	100

Age distribution shows that there were more pupils 953 (54.8%) in the age group from 10 to 14 years, followed by those in age group 5-9years 447 (25.7%) and fewer pupils in the age group from 15 to 20 years (19.5%.) The mean age was 11.74 years.

Females were slightly more 874(50.2%) than males 865(49.7%).

Table 3. **Distribution of active trachoma (TF/TI) by sex**

Active trachoma	Male		Female		Total [1739]	
	No	%	No	%	No	%
TF	24	1.4	24	1.4	48	2.8
TI	56	3.2	52	3	108	6.2
Total	80	4.6	76	4.3	156	9

Table 3 shows that there were more pupils with intense trachomatous inflammation 108(6.2%) (TI) as compared to those with follicular trachomatous inflammation (TF) 48 (2.8%) P=0.0001

There was no significant difference in prevalence of TF 80(4.6%) and TI 76(4.3%) by sex P=0.83.

Table 4. **Distribution of active trachoma (TF/TI) by age**

Age in years	T.F		T.I		TF + TI		Total n=
	No	%	No	%	No	%	
5-9	22	4.9	44	9.8	66	14.8	447
10-14	23	2.4	51	5.4	74	8	593
15-20	3	0.9	13	3.8	16	4.7	339
Total	48	8.2	108	19.0	156	8.9	1739

The table shows that age distribution of active trachoma demonstrated a higher prevalence of trachoma in the youngest group (14.8%) and it decreased with advancing age, being 8% in the age group from 10-14 years and 4.7% in the 15 to 20 years age group. P = 0.00185072.

Table 5: **Facial appearance of the pupils by age**

Age Years	FACIAL APPEARANCE								Total n=
	E. D		N. D		L.F.M		B.E.N.D.		
	NO %	TR %	NO %	TR. %	NO %	TR%	NO %	TR. %	
5 – 9	24 5.4	9 2	12 2.7	2 0.5	2 0.5	-	7 1.6	1 0.2	447
10–14	9 0.9	3 0.3	2 0.2	0 -	0 -	-	0 -	0 -	953
15–20	2 0.6	1 -	0 -	0 -	0 -	-	0 -	0 -	339
Total	35 2	13 (0.7)	14 0.8	2 0.1	2 0.1	-	7 0.4	1 0.1	1739

KEY:
L.F.M.= Leftover Food around Mouth

T.R.= Trachoma

B.E.N.D = Both Eye and Nasal Discharge

E.D = Eye Discharge

N.D= Nasal Discharge

A total of 58 (3.3%) pupils of the examined population had dirty faces. Eye discharge constituted 35 (2%) nasal discharge constituted 14 (0.8%) and left over-food around mouth 2 (0.1%). There was no statistically significant difference in trachoma between children with eye discharge and those with nasal discharge p=0.24. Seven pupils 7 (0.4%) had both eye and nasal discharges. Fifteen pupils 15 (22%) who had dirty faces had clinical trachoma. Of these, the majority were those who had eye discharge. The tendency to have a dirty face reduced with increasing age.

Table 6.**Distribution of pupils with conjunctiva scars by age and sex**

Age in years	Number of pupils	%	Male		Female		Total
			Nº	%	Nº	%	N=
5 – 9	0	0	0	-	0	-	447
10 -14	18	3.0	9	1.5	9	1.3	593
15 -20	21	6.2	13	3.8	8	2.4	339
Total	39	2.2	22	56.4	16	41	

A total of 39(2.2%) of the examined pupils had conjunctiva scars. Eighteen pupils (3%) were from the age group 10 to 14 years and 21(6.2%) in the age group 15 to 20 years. There were no pupils with conjunctiva scars in the smallest age group of 5 to 9 years. More males 22(56.4) than females 16(41%) had conjunctiva scars p=0.00000003.

Latrines were available in all schools. In 6(75%) schools they were temporary latrines and in 2(25%) schools they were permanent latrines. In all the schools, there were a maximum of two holes for all the pupils. All toilets were unprotected.

There were no refuse pits in all the schools visited.

None of the schools had water within the school compound. They all depended on the nearby shallow community wells. Small amounts of drinking water (40L) were found at each of the schools visited.

DISCUSSION.

Many previous trachoma prevalence studies involving children were household surveys.[14, 16,24,37,64] a few were school-based surveys. [5,9,39]

In Tanzania, school surveys on trachoma reported are either very old (Dodoma region[9] Singida rural schools, Masasi and Bagamoyo schools[10]) or are not directed on trachoma alone.

In this study, a school based prevalence study of trachoma was conducted in 8 primary schools in Mkuranga district Coast region Tanzania. The coverage of the targeted population at each of the eight selected schools varied from 48.4% to 100% with the lowest being at Mbezi primary school. The reason for low coverage common to almost all schools was poor attendance. In-spite of this out of the targeted 2000 pupils, 1739 had their eyes examined for signs of trachoma, making the coverage to be 86.9%.

Age distribution of the sampled population showed that, more than half of the pupils (54.8%) were aged between 10 and 14 years. This differed from the usual trend where the highest percentage of pupils is in the lowest age group. The change probably is attributed to the new

government policy, which with an aim to reduce illiteracy, has set up special classes " MEMKWA" for those children who missed the opportunity to get enrolled to class one at their appropriate age. To these classes, pupils beginning from the age of 10 years and above, who are willing to learn to read and write are enrolled. It is for this same reason that pupils aged up to 20 years are still found in primary schools.

Pupils who had active trachoma in all the schools visited constituted 9%. A slightly higher proportion of trachoma occurred among males (4.6%) as compared to females (4.3%) a difference that was not statistically significant. This is not different from findings of previous studies where there was no significant sex difference in the prevalence in trachoma in children.[15, 38]

Active trachoma was more in the smallest age group and it was decreasing with advancing age a finding similar to that encountered in previous studies done [35,45,49,64].

Out of the pupils who had active trachoma, 69.2% had intense trachomatous inflammation (T.I) where as 30.8% had follicular trachomatous inflammation. (T.F) This pattern is typical of endemic areas for trachoma where intense inflammation predominates in the

community.[1] Trachomatous inflammation- (Intense) carries an increased risk of developing conjunctiva scarring.[1-2] Repeated scarring of the conjunctiva leads to entropion, trichiasis and finally corneal opacification.[72]

People with clean faces are less likely to have trachoma Out of the pupils with dirty faces in this study, those in the 5-9 year age group were found to be the majority as compared to the 15-20 year age group. Observations by Taylor [45] Moalic.[25] West [64] found that the majority of children having dirty faces were those in the smallest age groups with the tendency to reducing with advancing age. Small children depend on their mothers /caretaker to be kept clean when at home or going to school. In this study 27.6%of those who had dirty faces had clinical trachoma and these were the very young who depend on caretakers to wash their faces. Hygiene in general when poor reflects itself more in children, than adults. This may explains the tendency of active trachoma to reduce as the age advances.[33,38,64]

Conjunctiva scars were observed in 2.2% of the sampled population. About 6.2% in those aged 15 to 20 years, and 1.9% in those aged 10-14 years. No scarring was observed in the smallest age group of 5-9 years. Conjunctiva scarring in this study is seen at a young age from 10 years.

These are potential candidates to developing trichiasis in their early adulthood. More males (56.4%) than females (41.0%) had conjunctiva scars. In a community based survey done in Mkuranga district, conjunctiva scarring was observed in a seven-year-old child.[66]

Mkuranga district has only 4% permanent latrines, 70% temporally and 26% have no latrines at all.[73] (A permanent latrine has a strong wall, a door that can open and close and a roof.) Latrines were available in all the schools visited however, 75% were temporally. A maximum of 2 latrines per school each with one hole is far from being enough. According to the Tanzanian directive for construction of schools there should be at least, one hole for 10 pupils a ratio of 1:10. At these schools hole /pupil ratio is about 1:130.Could these contribute to the low usage or the pupils have no habit of using latrines? Could this be a reflection of what was found in the community? This needs to be researched upon. Further in all the schools visited, latrines were not covered and there was no water for washing hands after latrine use. Though latrines were far from enough it was observed that they were not in constant use as observed by overgrowth of grass up to the doorsteps. Long term preventive measures to trachoma control demands changing behavior. Behavior change is the most difficult element of the SAFE strategy. Provision of enough latrines here may not assure their use.

The Ministry of Education in cooperation with the Ministry of Health ought to work hand in hand to work out measures that would help improve the pupil's hygiene.

In the community, only 55% households it is reported had refuse pits. In this study, all the schools visited had no refuse pits. They got rid of their wastes (mainly dry grass) by burning. In spite of this, the general appearance of the schools looked clean. The type of waste could have been an advantage in this setting. The schools by not having any refuse pits have nothing to demonstrate to the pupils the importance of refuse pits.

Insufficient water in a community has in many situations been associated with poor hygiene and an increased incidence of trachoma.[36] This is not always true though, for example in the rural Nile delta of Egypt, where water poses no problem active trachoma was found to be prevalent in 36.5% of the examined children and trachomatous trichiasis in 6.5% of the examined adults. Such findings suggest that while scarcity of water may be associated with trachoma, increased risk of the disease is probably not a simple direct function of water

availability. In this study, none of the schools visited had a source of water within the school compound. They all depended on the nearby community shallow wells. Two buckets of water found at each school as reported by the teachers was for drinking purposes and not for washing hands or face. Although health education is taught in all the schools, there is no practice of what is taught as evidenced by lack of water for washing hands or cleaning faces absence of a refuse pit and inadequate and underused latrines.

CONCLUSION

This study has shown that trachoma is present in primary school children in Mkuranga district, coast region Tanzania, where its pattern is not different from other endemic areas of the developing world. Intense trachomatous inflammation predominated over follicular inflammation. Scarring was observed in the young, an indication of probable early blindness. Personal hygiene and environmental sanitation of the schools visited was below standard.

RECOMMENDATIONS

1. Primary schools in Mkuranga district should construct permanent and adequate latrines.
2. Water at the schools for hand and face washing should be provided. The ministry of water / energy in collaboration with village governments should ensure the availability of water in the schools.
3. School authorities with village governments should ensure availability of refuse pits in school compounds. Health officers should play a leading role in this.
4. Awareness of good hygiene has to be awoken in school pupils by teaching and demonstrating what is taught

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Appendix 1.

Questionnaire From

Name of pupil .....

Name of Caretaker .....

Name of Village .....

Age ..... Sex .....

2. **Visual Acuity**

RE ..... LE .....

3. Eye Examination

Signs

	T.F		T.I		T.S		T.T		C.O	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
RE										
LE										

4. Facial Appearance

	YES	NO
Eye discharge		
Nasal Discharge		
Food round mouth		

Date ..... Signature of Interviewer